

TITLE OF THE INVENTION

HERMETIC COMPRESSOR

5 CROSS-REFERENCE TO RELATED APPLICATION

This application claims the benefit of Korean Application No. 2003-26634, filed April 28, 2003, in the Korean Intellectual Property Office, the disclosure of which is incorporated herein by reference.

10 BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates, in general, to hermetic compressors and, more particularly, to a hermetic compressor which is capable of damping
15 operational noise and vibration during operation thereof.

Description of the Related Art

Generally, compressors are machines that compress a substance, such as a gas refrigerant, to reduce a volume of the substance or change a phase of
20 the substance. As an example of the compressors, hermetic compressors are typically used in refrigeration systems to compress a gas refrigerant within a hermetic compression chamber, prior to discharging the compressed refrigerant to a condenser.

Conventional hermetic compressors having the above-mentioned use
25 have a hermetic casing. The hermetic casing is fabricated with upper and lower casing parts assembled into a single body. A drive unit to generate a drive power, and a compression unit to suck and compress the gas refrigerant by use of the drive power output from the drive unit are installed in the hermetic casing.

In the hermetic compressors, the drive unit includes a stator along which
30 an electromagnetic field is generated, and a rotor with a rotating shaft axially penetrating the rotor. An eccentric part is provided at an upper end of the rotating shaft.

In a detailed description, the drive unit of the conventional hermetic compressors has a stator that generates an electromagnetic field when electric power is applied to the stator. The rotor is rotated by the electromagnetic field generated along the stator. The rotating shaft axially penetrates a center of the rotor so as to be rotated along with the rotor.

The compression unit has a cylinder block which defines a compression chamber therein. A cylinder head is mounted to the cylinder block. The cylinder head has both a suction chamber to guide the gas refrigerant into the compression chamber and an exhaust chamber to guide the compressed refrigerant from the compression chamber to an outside of the hermetic casing. A piston is received in the compression chamber to perform a rectilinear reciprocating action in the compression chamber.

The hermetic compressor having the above-described construction is operated as follows. When the electric power is applied to the stator of the drive unit, the electromagnetic field is generated along the stator. The rotor with the rotating shaft is thus rotated by the electromagnetic field generated along the stator. In such a case, the rotating action of the rotor is converted into the rectilinear reciprocating action of the piston in the compression chamber by means of a connecting rod which connects the piston to the rotating shaft. Due to the rectilinear reciprocating action of the piston in the compression chamber, the piston sequentially sucks, compresses, and exhausts the gas refrigerant.

However, the conventional hermetic compressors are problematic as follows. That is, during the operation of the hermetic compressors, specific high- and low-frequency waves are radiated from the compression chamber to an inner surface of the hermetic casing, due to both pressure pulsation of the gas refrigerant generated in the compression chamber in accordance with a compression of the refrigerant, and mechanical noise and vibration generated at a junction between an inner surface of the compression chamber and an outer surface of the piston due to frictional contact between the compression chamber and the piston. In such a case, the frequency of the specific high- and low-frequency waves radiated to the inner surface of the hermetic casing is identical with a resonant frequency of the hermetic casing. The hermetic casing thus

resonates to generate abnormal noise and vibration upsetting those around the hermetic compressor.

SUMMARY OF THE INVENTION

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Accordingly, it is an aspect of the present invention to provide a hermetic compressor, in which a resonant frequency of a hermetic casing is changed to prevent a resonance of the hermetic casing to dampen operational noise and vibration of the hermetic compressor during an operation.

10 Additional aspects and advantages of the invention will be set forth in part in the description which follows and, in part, will be obvious from the description, or may be learned by practice of the invention.

The foregoing and other aspects of the present invention are achieved by providing a hermetic compressor, including a hermetic casing to house therein a
15 drive unit to generate a drive power and a compression unit to suck and compress a gas refrigerant by use of the drive power output from the drive unit, and a damping unit to elastically support the hermetic casing with predetermined elasticity, thus changing a resonant frequency of the hermetic casing.

The hermetic casing has upper and lower casing parts assembled into a
20 single body, and the damping unit is provided at at least one of the upper and lower casing parts.

The damping unit has a mounting part at which the damping unit is mounted to the hermetic casing, and an elastic support part provided in a state of being elastically deformed to elastically support the hermetic casing.

25 The mounting part of the damping unit is mounted to the hermetic casing through a spot welding process.

The elastic support part has a flange part projected in a direction to a length which exceeds a plane aligned with a surface of the mounting part. The flange part thus elastically supports the hermetic casing in the state of being
30 elastically deformed.

The elastic support part also has a wing part to connect the flange part to the mounting part. The wing part is rounded in a direction opposite to a

projected direction of the flange part so as to allow the elastic support part to elastically support the hermetic casing with the predetermined elasticity.

BRIEF DESCRIPTION OF THE DRAWINGS

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These and other aspects and advantages of the invention will become apparent and more readily appreciated from the following description of the preferred embodiments, taken in conjunction with the accompanying drawings of which:

10 FIG. 1 is a side sectional view showing the construction of a hermetic compressor, according to an embodiment of the present invention;

FIG. 2 is a perspective view of a damping unit which is mounted in an upper casing part constituting a hermetic casing of the hermetic compressor of FIG. 1;

15 FIG. 3 is a side sectional view showing the damping unit of FIG. 2 before the damping unit is mounted in the hermetic casing of FIG. 1;

FIG. 4 is a side sectional view showing the damping unit of FIG. 2 after the damping unit is mounted in the hermetic casing of FIG. 1; and

20 FIG. 5 is a graph showing a noise damping effect of the hermetic compressor according to the present invention, in comparison with a conventional hermetic compressor.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

25 Reference will now be made in detail to the present preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to like elements throughout.

30 FIG. 1 is a side sectional view showing the construction of a hermetic compressor, according to an embodiment of the present invention.

As shown in the drawing, the hermetic compressor according to the present invention has a hermetic casing 10 which is fabricated with upper and

lower casing parts 11 and 12 assembled into a hermetic single body. A drive unit 20 to generate a drive power, and a compression unit 30 to suck and compress a gas refrigerant by use of the drive power output from the drive unit 20 are installed in the hermetic casing 10.

5 In the hermetic compressor, the drive unit 20 includes a stator 21 along which an electromagnetic field is generated, and a rotor 22 with a rotating shaft 23 axially penetrating the rotor 22. An eccentric part 24 is provided at an upper end of the rotating shaft 23.

10 The compression unit 30 has a cylinder block 31 which defines a compression chamber 31a therein. A cylinder head 32 is mounted to an end of the cylinder block 31 to cover the compression chamber 31a. The cylinder head 32 has both a suction chamber 32a to guide the gas refrigerant into the compression chamber 31a, and an exhaust chamber 32b to guide the compressed refrigerant from the compression chamber 31a to an outside of the
15 hermetic casing 10. The compression unit 30 also has a valve unit 33 which is provided at a junction between the cylinder block 31 and the cylinder head 32. The valve unit 33 has a suction valve plate to control the flow of the refrigerant into the compression chamber 31a, and an exhaust valve plate to control the flow of the refrigerant from the compression chamber 31a.

20 A piston 34 is received in the compression chamber 31a. The piston 34 is connected to the eccentric part 24 of the rotating shaft 23 through a connecting rod 35, such that an eccentric rotating action of the eccentric part 24 is converted into a rectilinear reciprocating action of the piston 34. That is, when the eccentric part 24 is rotated along with the rotating shaft 23, the piston 34
25 rectilinearly reciprocates in the compression chamber 31a.

30 A damping unit 40 is provided at the upper casing part 11 of the hermetic casing 10 at a predetermined position, such that the damping unit 40 elastically supports the upper casing part 11 to change a resonant frequency of the upper casing part 11. The construction of the damping unit 40 will be described herein below, with reference to FIG. 2.

FIG. 2 is a perspective view of the damping unit mounted in the upper casing part of the hermetic casing. As shown in the drawing, the damping unit

40 is an integrated body made of a metal material and provided with a mounting part 41 at which the damping unit 40 is mounted in the upper casing part 11 at the predetermined position, and an elastic support part 42 which elastically supports the upper casing part 11.

5 In the damping unit 40, the mounting part 41 is a flat part at which the damping unit 40 is mounted to the predetermined position of an inner surface of the upper casing part 11. In the present invention, the mounting of the mounting part 41 to the upper casing part 11 is preferably performed through a spot welding process capable of securely mounting the mounting part 41 to the upper
10 casing part 11.

The elastic support part 42 is integrally provided at each side of the mounting part 41. The elastic support part 42 has a flange part 42a and a rounded wing part 42b. As best seen in FIG. 2, the rounded wing part 42b integrally extends outward from each side of the mounting part 41 while being
15 rounded in a direction opposite to the inner surface of the upper casing part 11. The flange part 42a extends from an outside end of the rounded wing part 42b in a direction toward the inner surface of the upper casing part 11 to a length "S" which exceeds a plane aligned with a flat surface of the mounting part 41.

In the preferred embodiment shown in the drawings, the damping unit 40
20 is provided at the upper casing part 11 of the hermetic casing 10. However, it should be understood that the damping unit 40 may be provided at the lower casing part 12 of the hermetic casing 10, in addition to the upper casing part 11, without affecting the functioning of the present invention. That is, the damping unit 40 may be provided at at least one of the upper and lower casing parts 11
25 and 12.

FIG. 3 is a side sectional view showing the damping unit 40 before the damping unit 40 is mounted in the hermetic casing 10. FIG. 4 is a side sectional view showing the damping unit 40 after the damping unit 40 is mounted in the hermetic casing 10.

30 As shown in FIGS. 3 and 4, when the damping unit 40 is securely mounted to an inner surface of the hermetic casing 10 at the mounting part 41 through the spot welding process, the two flange parts 42a of the damping unit

40 are elastically thrust backward by the length "S" by the inner surface of the hermetic casing 10 while elastically deforming the two rounded wing parts 42b, as best seen in FIG. 4. Therefore, the elastic support parts 42, formed by the flange parts 42a and the rounded wing parts 42b, elastically support the hermetic casing 10 while being elastically deformed.

In such a case, since the rounded wing parts 42b are easily elastically deformed due to the rounded shape thereof, the elastic support parts 42 are prevented from being plastically deformed. Therefore, the elastic support parts 42 stably and elastically support the hermetic casing 10, without losing elasticity thereof.

The operational effect of the hermetic compressor having the above-described damping unit 40 will be described herein below.

When the electric power is applied to the hermetic compressor, the electromagnetic field is generated along the stator 21 of the drive unit 20. The rotor 22 with the rotating shaft 23 is thus rotated by the electromagnetic field generated along the stator 21. Therefore, the piston 34, connected to the eccentric part 24 of the rotating shaft 23 through the connecting rod 35, rectilinearly reciprocates in the compression chamber 31a, thus sequentially sucking, compressing, and exhausting the gas refrigerant.

During the operation of the hermetic compressor, specific high- and low-frequency waves are radiated from the compression chamber 31a to the inner surface of the hermetic casing 10, due to both pressure pulsation of the gas refrigerant and mechanical noise and vibration generated at the junction between an inner surface of the compression chamber 31a and an outer surface of the piston 34 due to frictional contact between the compression chamber 31a and the piston 34. In such a case, the frequency of the specific high- and low-frequency waves radiated to the inner surface of the hermetic casing 10 may be identical with a resonant frequency of the hermetic casing 10, thus allowing the hermetic casing 10 to resonate to generate abnormal noise and vibration upsetting those around the hermetic compressor, as described for conventional hermetic compressors. However, the hermetic compressor of the present invention has the damping unit 40 which is mounted on the inner surface of the

hermetic casing 10 to elastically support the hermetic casing 10 and change the resonant frequency of the hermetic casing 10. It is thus possible to prevent the hermetic casing 10 from resonating with the specific high- and low-frequency waves radiated to the inner surface of the hermetic casing 10, thereby dampening operational noise and vibration of the hermetic compressor during an operation thereof. That is, the damping unit 40 stably and elastically supports the hermetic casing 10, with predetermined elasticity thereof, thus changing the resonant frequency of the hermetic casing 10.

FIG. 5 is a graph showing a noise damping effect of the hermetic compressor according to the present invention, in comparison with a conventional hermetic compressor. As shown in the graph, the hermetic compressor having the hermetic casing 10 with the damping unit 40 according to the present invention effectively dampens the operational noise thereof, in comparison with the hermetic compressor having a conventional hermetic casing without any damping unit, since the damping unit 40 changes the resonant frequency of the hermetic casing 10 and thereby prevents a resonance of the hermetic casing 10.

As apparent from the above description, the present invention provides a hermetic compressor, in which a damping unit is mounted on an inner surface of a hermetic casing to stably and elastically support the hermetic casing and change a resonant frequency of the hermetic casing. The hermetic casing is thus prevented from resonating with specific high- and low-frequency waves radiated to the inner surface of the hermetic casing, thereby dampening operational noise and vibration of the hermetic compressor during an operation thereof.

Although a preferred embodiment of the present invention has been shown and described, it would be appreciated by those skilled in the art that changes may be made in these embodiments without departing from the principles and spirit of the invention, the scope of which is defined in the claims and their equivalents.